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ABSTRACT

The National Center for Higher Education Management Systems (NCHEMS) has developed a library statistical data base which concentrates on the management information needs of administrators of public and academic libraries. This document provides an overview of the framework and conceptual approach employed in the design of the data base. The data contained in the management information system describes the environment, the overall resources, and the programmatic activities of the library. Environmental data for the library includes information which describes the external setting of the library, its internal organization, and the target group it serves. The overall resources of the library include four major types of data: collection resource data, human resource data, financial data, and facility resource data. The data concerning programmatic activities organizes the library into major activity or functional areas. For each of these a series of measure categories is used to describe and evaluate the activities of the library. These measures describe revenues and expenditures, personnel, facilities, activities, users, and outcome/performance of each of the activity areas. Changes and refinements are expected through practical applications of the system. Readers are advised to look at "Library Statistical Data Base Formats and Definitions," which gives the detailed set of data structures relevant to the categorizations of information, terminology and definitions employed in the design of the system. (Author/JPF)

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COMMENTARY TO

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

LIBRARY STATISTICAL DATA BASE

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ABSTRACT

The development of a library statistical data base has concentrated on the management information needs of public and academic libraries. In this content, the data contained in the management information system describes the environment, the overall resources, and the programmatic activities of the library. The environmental data of the library includes information which describes the external setting of the library, the internal organization of the library and the target group served by the library. The overall resources of the library include four major types of data: collection resource data, human resource data, financial data, and facility resource data. Finally the data concerning programmatic activities organizes the library into major activity or functional areas. For each of these, a series of measure categories are used to describe and evaluate the activity of the library. These measures describe revenues/expenditures, personnel, facilities, activities, users, and outcomes/performance of each of the activity areas.

The framework of information and the data set described provide the library manager a more informed basis for 1) internal decision-making and planning, 2) comparison and communications, and 3) reporting to external agencies and organizations. As such, the data base as outlined and presented represents a first major effort to develop such a comprehensive system for academic and public libraries. Although changes and refinements will be dictated through the practical application of the data base, it provides an excellent beginning to a valuable management tool for the individual library and library manager.

PREFACE

As part of a U. S. Office of Education grant, the National Center for Higher Education Management Systems (NCHEMS) has developed a Library Statistical Data Base. That data base, or management information system, is detailed in Commentary to Library Statistical Data Base and the Library Statistical Data Base Formats and Definitions.

Both documents discuss and present data which describe the library. The framework for this discussion is based upon three distinct areas of information: The environment of a library, the overall resources of the library, and finally, the programmatic activities of a library.

There is a cautionary note that library managers and others should consider in reviewing and implementing this management system. The various components of the information structure, although well grounded in NCHEMS products, have not been broadly tested in the library community. Thus, this system is viewed as an initial effort which requires revision and modification. This is particularly true in the area of outcome/performance measures which are clearly in an early stage of refinement. In addition, much information concerning the specific uses and applications by library managers is unknown. Nonetheless, NCHEMS believes that this data base provides an excellent beginning point to providing a managerial tool for library administrators and the library profession as a whole.

NCHEMS is interested in receiving comments from library managers and other interested persons about any and all aspects of the management information system. Specific comments or questions should be directed to Maryann Kevin Brown, NCHEMS, P.O. Drawer P, Boulder, CO 80302.

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I. INTRODUCTION

Several distinct but dependent conditions have combined to create a demand by library managers for that resource in which libraries specialize -- information. On the one hand, certain of these conditions -- many of which have economic realities at their root -- serve to focus on efforts to improve management and decision making within individual libraries. As financial resources become increasingly difficult to acquire and as inflation takes away much of the purchasing power of those funds that are obtained, library managers are faced with difficult decisions concerning how to allocate and use resources in order to best meet the needs of the library's users. Other conditions -- many of which derive from changing resource allocation and oversight practices of library funders -- are creating requirements for library administrators to demonstrate both efficiency in the use of resources and organizational effectiveness. Limitations on the resources available to the various funders of libraries as well as the concern for accountability have created an environment in which the ability to provide information about the library and its operation to sponsors is crucial to the vitality and viability of the organization.

Taken together, these various trends generate a need for better data about libraries -- data that will provide a foundation on which to base decisions on complex internal questions and that will allow librarians to be responsive to the information needs of their external constituents. It was within this context that the National Center for Higher Education

Management Systems (NCHEMS) undertook a project that had as its primary purpose the identification and definition of those data items most needed for both internal decision making and external communication and reporting. This document is intended to provide a conceptual approach to library data, and a brief overview of the data set that has been identified through the activities of that project. A companion document, Library Statistical Data Base Formats and Definitions, contains detailed data formats and definitions.

II. CHARACTERISTICS OF THE MANAGEMENT INFORMATION SYSTEM

An analysis of the data needs of library managers for both internal management uses and external communications has led to the conclusion that data about libraries must encompass four distinct types. These are: data that describe the environment of the library, the resources of the library, the programs of the library (i.e., what a library does), and the performance or outcomes of the library's activities.

The first type of data describes the environment in which the library resides. This type of data places a particular library in context; that is, by describing the governance structure (academic, public, etc.) characteristics of the intended users, and so forth.

The second type of data describes the broad resources of the entire library which serves to define what a library is. The collection itself is the most obvious of these resources. The relative importance of this area is apparent through the widespread reporting and use of data about acquisitions, collection size, and so forth. While collection measures are of prime concern, other kinds of resources are also crucial

in describing the overall library and its services. These other resource categories are personnel, financial, and facility resources.

The third major type of data useful to library managers describes what a library does, i.e., the programmatic activities or functions of a library. This type of data identifies the primary program areas within a library and provides management information about each function (e.g., how many resources were used, how many users were served, how well were the services provided).

The final type of data describes outcome or performance measures of a library. These data serve to evaluate the environment of a library, the utilization of resources, and the activities of the library noted in the program data.

In summary, the data items identified as being required for management purposes include:

- environmental data
- resource data
- program data
- outcome/performance data.

Each of these is described more fully in subsequent sections.

Note: In selecting data items for inclusion in this data base, an attempt has been made to include those data that are required for reporting to at least the federal government and those data required to provide at least a minimal set of data for internal management purposes. In the context of reporting, it is hoped that the data definitions included in the information system will evolve into a standard language for inter-organizational communication. In the context of internal management uses, the inevitability of unique organizational structure is recognized. Thus, it is anticipated that the data set presented will take the form of a starting point -- a prototype from which modifications will necessarily be made to accommodate the specific needs of individual libraries.

III. THE ENVIRONMENT OF THE LIBRARY

The first major section of the management information data base is the environment of the library. There are a number of descriptors about the library as a whole that are requisite to management information, yet are not a part of program data or resource data. These are both external and internal in nature and serve to further characterize the library itself. Management questions that serve to highlight the components of the library environment are:

- What are the unique factors about the institution or agency in which the library exists that affect the library?
- What are the unique factors about the internal organization of the library that affect the library?
- What are the characteristics of the population for which the library is intended to serve?

Clearly then, the data base must address:

- External setting of the library;
- Internal organization of the library; and,
- The target group for which library services are intended.

The external setting of the library describes the relationship of the library to its parent institution or the extra-library governance structure, the relationship of the library to other organizations (such as networks, other libraries, etc.), and the relationship of the library to its funders.

The relevant internal factors of the library include the reporting structure, the service points and outlets, and special features which affect either service or resource accessibility and availability.

Population characteristics which are of concern from a management perspective are those factors which influence either the use of the library or the character of services or resources provided by the library. These variables differ with types of library. Within academic libraries, for instance, relevant population factors include educational levels, disciplines, credit hours, and current areas of research concentration. Factors for public library population, on the other hand, are more diverse: educational levels, occupational levels, age, ethnic make-up, income and unemployment. All of these data, then, serve as a basis upon which to compare users and the target population.

IV. INFORMATION ABOUT LIBRARY RESOURCES

This section involves a discussion of the types of resources that describe what a library is. In this context, these resources are the assets of the total library. The most prominent resource is the collection itself. In addition to the collection, other resource categories identified by the data base, and discussed in this section, are human resources, financial resources, and facility resources.

Resource management represents a vital concern for library managers. As such, the management of a resource involves a description of that resource as well as some determination of the quality of that resource and the effectiveness of resource utilization. In the case of collection resources, it becomes severely limiting to the manager to describe the collection only in terms of dollars or size. In contrast, it is much more desirable for the manager to assess both the quantitative and qualitative aspects of the collection.

These same concerns also apply to human, financial, and facility resources. For example, although people are assigned specific tasks within the library, taken as a group, people represent a major library resource. The same can be said for facility resources (e.g., space and equipment) which are a total library resource and for financial resources which are in support of the total library. Thus, the manager has an acute need to have a significant amount of quantitative and qualitative resource information.

The Library Collection Resource

The collection represents a basic resource of the library about which the library manager requires a significant amount of information.

The basic subcategories used to measure the collection resource are:

- physical description
- intellectual description
- relevancy
- accessibility
- availability
- utilization.

The first subcategory -- physical description -- measures the physical dimensions of the library collection. Physical dimensions are depicted within the data base in terms of the numbers (physical volumes) and the types of format represented in the collection. For some management purposes, factors such as shelf space utilized, oversized print materials, square footage required to store materials, etc. may also be useful pieces of

information. However, physical units are, in general, considered to be sufficiently descriptive of the physical dimension.

Measures of the intellectual dimension of the collection comprise the second subcategory. Descriptors of the intellectual content include the bibliographic units and volumes held and the breadth and depth of the collection. Characteristics of breadth are fundamental in determining the capability of the collection in meeting general information requirements. Depth, however, describes the capability of the resource in meeting specialized information needs. The measurement of the scope of intellectual content is difficult. Presently, the subjects covered and the extent of coverage represent the most realistic measures of scope.

Another subcategory of the collection is its relevancy to the library's clientele. Relevancy is measured by such factors as "appropriate" depth and breadth of the collection, age of the collection, and capability of the collection to meet the needs of the library user. There are no obvious and direct measures of relevancy. Instead, the data base examines the correspondence of subjects covered, density of subjects, and recency of acquisitions with the features of the population the library is intended to serve.

Accessibility, another subcategory, evaluates the collection. Accessibility refers to the physical positioning of collection materials and the ease with which the user can locate the desired information. Measurement is based upon issues such as the delivery time of materials to the patron from the collection, from off-site storage, and through

recall of materials in circulation; the ease with which a patron can locate desired materials through the public catalog and on the shelf; and the unsatisfied demand for materials which are owned by the library but are inaccessible to the patron.

Availability is the fifth subcategory and is used to evaluate the collection. This refers to whether the title or information requested by the user is held in the collection at all. Examples of these measures include the total requests versus requests filled by the collection and percent of current publications which are purchased by the library.

The final subcategory used to assess the collection is utilization. Utilization measures are an indication of the value of the collection to the user. The manager needs to know how much of the collection is used and by whom, both through circulation and from in-library use; what percentage of the collection is circulated through interlibrary loan; how often pieces of information from the collection are used; to what extent the collection remains unused; how many patrons are return users; what is the profile of the user and the material used.

Human Resources

Human resources are a major category of resources available to the library. Often the library will find itself spending 75% or more of its dollar resources in the area of personnel costs. The provision and delivery of library services are dependent upon a substantial number of personnel. Therefore, it is important that the data base includes a set of information which describes this personnel or human resource.

From a broad perspective, it is advantageous to the manager to have a composite picture of the amount or quantity of human resources available for use in program areas, the cost or price of the human resources to the library, the skill level of the human resources, and some additional demographic descriptors of the human resources. Each of these are elements of the data base.

To describe the quantity of human resources available, the data base counts employees in several ways; full-time and part-time status, full-time equivalents based on service months, and head counts. The skill level is treated by classifying employees according to the educational level attained and, in detail, for those degrees pertinent to the library field. The price of the resource is dealt with through the categorization of employees according to salary levels. Finally, the data base demographically describes employees by sex and race/ethnic categories.

Financial Resources

Financial resources represent the third major category that describes the resources available to the library. Generally it is important for a manager to be able to describe the overall financial picture of an organization, particularly in terms of assets and liabilities. However, for academic and public libraries, the need to describe (and the control over) financial resources is marginal for the library manager. Academic and public libraries are part of larger entities (e.g., an academic institution, a municipal government) in which financial resource decisions

are largely outside the purview of the library or library manager. Thus, this component of the management information system is very brief, covering only unique endowments to the library and levels of long-term debt directly attributable to the library.

Facility Resources

Facility resources is the final broad category in which to describe the library resources. The manager needs to have an overall picture of the amount of facility resources available to the library, the cost and quality of library facilities, and the special equipment of the library.

The data base provides several ways to describe the amount of facility resources available, the capacity of the library to hold the collection, the actual space contained in the library as measured in square footage, and the seating capacity of the library. The cost of the library is described in terms of the dollar value of the buildings and capital equipment of the library. Also included is the special equipment of the library by type, amount, and accessibility.

Each of these resource categories provides data that describe basic components of the library, i.e., what a library is. The next section expands on data about the library by discussing what the library does and ways to describe it.

V. INFORMATION ABOUT LIBRARY PROGRAMS

Introduction

This section is concerned with the identification of the different functions performed by the library and describes those functions along dimensions that are important to library managers. The first part of this section presents a way to describe what goes on within a library and three alternative levels of detail to categorize these activities. The second section discusses the dimensions in which to further describe each of these program areas.

Programmatic Activities of the Library

A library is a complex entity that consists of a number of programs, each of which is a set of activities undertaken for a particular purpose(s) requiring a set of resources to accomplish a desired outcome(s). For most purposes, it is meaningless for the manager to describe the library as a whole. Rather it becomes much more valuable to categorize the library into primary programmatic activities.

The categories of programmatic activities of libraries are difficult to derive because they relate so intricately to the level of sophistication existent or desired within a particular library. For example, a small public library is very simply organized with only a few programs and a limited data system. However, at the other extreme, a library of a major research university would probably have a large number of program

areas and a sophisticated data system. Thus, flexibility within the information system was essential to accommodate both types of libraries in a consistent and logical manner.

The NCHEMS solution to this dilemma was the identification of three possible categorizations of programs (from level 1 to level 3), each successive level consisting of finer program divisions. The broadest category, level 1, consists of the following programmatic activities or functions:

- Administrative Services
- User Services
- Technical/Collection Services
- Instructional Services
- Support Services.

This level of categorization is probably most appropriate for those libraries that have minimal data requirements.

The level 2 categorization of activities is slightly more disaggregate and is consistent with the functional categories used in the Program Classification Structure, an NCHEMS document which provides a taxonomy for academic institutions to classify programs. Thus, a level 2 categorization is very appropriate for libraries which are part of an academic organization.

Finally, level 3 is the most detailed program categorization. In many ways level 3 resembles the departmental lines that exist within

a large library. For that reason, this level may be most appropriate for large, complex libraries.

Figure 1 is an overview of each of the three levels of detail of programmatic activities. For the most part, level 1 detail is utilized within the data formats and definitions of the management information system. It would be ideal for most libraries to use a level 2 categorization since this would provide the most meaningful information. It is important to recognize that this may not be possible because of the existing data system or other circumstance. Managers should choose that level which best meets their current and future needs.

Figure 1
LEVELS OF PROGRAMMATIC ACTIVITIES

LEVEL 1	LEVEL 2	SELECTED PROGRAMS UNDER LEVEL 3
Administrative Services	General Administrative Activities	- Management - Fiscal Operations - Public Relations & Development - Personnel Services - Planning
	Organizational & Personnel Development Activities	- Personnel Development - Organization Development
User Services	Materials Distribution	- Circulation Services - Reserve Services - Media Distribution Services - User Copying Service
	Information Services	- Reference Services - Cienteles Directional Service
	Interinstitutional Exchange & Loan Services	- Interlibrary Loan Service - Interinstitutional Delivery
Technical/ Collection Services	Collection Development	Collection Development Services
	Materials Acquisition	- Searching/Verification - Acquisitions Services/Ordering - Gift/Exchange Services
	Materials Organization and Control	- Cataloging Services - Periodical Check-in Services - Catalog Maintenance & Production
	Materials Preparation/Production	- Binding & Repair Services - Physical Processing - Media Production Services
Instructional Services	General Instruction Activities	- General Education Programs - Public Information Programs - Special Services Programs
Support Services	General Support Activities	- Logistical Services - Physical Plant Operations

Program Measures/Descriptors

For information about programmatic activities to be valuable to the manager, there are a number of descriptors that should be contained in the data base. Largely these descriptors can best be determined as the individual manager reflects on broad questions he or she needs to address about each program area of the library. These management questions are:

- What are the sources of library funding?
How much is received from these sources?
How are these funds spent and how can I measure this?
- How many and what types of human resources do I have at my disposal?
How can I describe these human resources?
How do I utilize these resources?
- What facilities and space do I have at my disposal?
How do I use these facilities?
- How can I describe what goes on in various departments of the library?
What is the workload for my employees?
- Who utilizes my services?
What services do they utilize?
- What are the outcomes of library services?
What level of performance does the library have?
How does the level of performance relate to my intended objectives?

This series of questions leads directly to the identification of a parallel list of categories of measures:

- Financial measures
- Personnel measures
- Facility measures
- Activity measures
- User measures
- Outcome/Performance measures.

Each of these categories is discussed in detail to explain the types of data included in the management system.

The financial measures included in this system encompass two basic types of data -- revenues and expenditures. Revenue data focus upon funding sources and levels of funding and, in the case of restricted funds, mapping these data to specific activity centers of the library. With respect to expenditures, operating expenditures are categorized in terms of salaries, benefits, supplies and services, and non-capital equipment expenditures.

The personnel component contains data elements that describe the kind, amount, and type of employees utilized within the programmatic activities (as listed in Figure 1). Included in these measures are the number of employees according to full-time status, part-time status, and full-time equivalents; contributed services; service months for employee categories; education level of exempt employees; and the types of employees according to the personnel resource categories. In other words, these measures represent the same descriptors of the human

resource mapped to specific activity centers of the library.

The facilities measures contain data that describe the characteristics of facilities in terms of seating capacities, special seating areas, and shelving capacity. In addition, the facility resources of the library defined in terms of assignable square feet for a number of room use categories are mapped to the specific program categories that utilize this space.

The activities component of the data base describes the type and level of activities that occur within the various areas of the library. Broad subcategories in this component include such measures as the direct circulation by type of circulation material, reference transactions by type of transaction, and interlibrary loan activity by type of material, and so forth.

The user component of the data base contains items that describe who uses the library and what they utilize within the library. For academic libraries, the user categories are synonymous with common categories of students, e.g., undergraduate, graduate, part-time, full-time, etc. For public libraries, these categories reflect the broad community, e.g., preschool, children, adults, etc.

Finally, the outcome/performance component evaluates the programmatic categories and measures the results or impacts of program activities. Because of the unique problems with these measures, they are discussed in length in the following section.

VI. OUTCOME/PERFORMANCE MEASURES

Outcome measures represent a major component of management information; one which is difficult to articulate and measure. In reality, divisions within a library exist to carry on a number of activities. These activities are translated into objectives which should be quantifiable and combine to form programs. Outcomes are measures of the results, impacts, or consequences of programs which represent what the library sets out to do.

From a practical standpoint, the measurement of impact or the "value added" is elusive if not impossible. Examples of outcome measures that are concerned with impact or value added illustrate the complexity of outcome measures. For example, the dollar value of improved decisions or the impact of the interlibrary loan program are intricate and difficult to measure. This is most clearly exemplified in the academic library where the concept of impact and value added of the library is linked directly to the assessment of educational outcomes or results of the educational program. In this case, it is impossible to disassociate the impact directly attributable to the library and that linked to academic instruction. Given these obvious complexities, the concept of outcomes has been translated within this data system into terms of performance measures -- a decidedly more realistic concept to codify and measure.

Performance measures represent a set of measures that assess the library's level of objective attainment.* Performance measures have two perspectives -- internal and external. The internal perspective relates to the level and adequacy of performance that are managerial concerns of the library. For example, the error rate of personnel and fiscal transactions is a management concern. In contrast, the external perspective of performance concerns the ability of the library and its activities to meet the needs of the users. An example of a performance measure from this perspective is the user satisfaction with reference services.

As is readily apparent from the discussion thus far, the area of outcome/performance measures is one that is developmental in nature. Nonetheless, a number of performance measures have been included in Library Statistical Data Base Formats and Definitions. Library managers, however, should view these measures as a tentative list that should be extensively tested and refined. Managers should also be cognizant of the ideosyncratic character of performance measures. This is due to their direct relationship with library program objectives which are unique to individual libraries.

*The library's objectives should be clear, concise statements of ends to be achieved with regard to a particular goal by each library program area. These objectives should also be stated in quantifiable, or measurable, terms and presumes that courses of action will be undertaken to attain them.

VII. SUMMARY

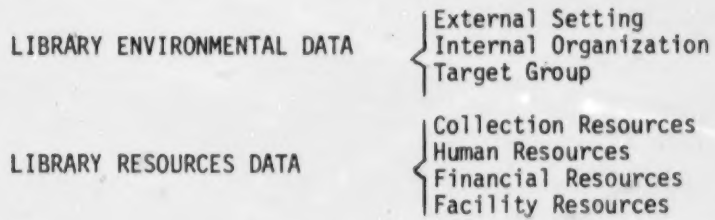
At this point we have completed the development of the structure of this management information system for academic and public libraries. Figure 2 provides a graphic overview of the complete management information framework. A brief review provides for additional synthesis of this system.

At the outset we discussed several compelling reasons that exist for library managers which have led to the development of this system. The environmental data (superimposed above the matrix) of the library, which describes the setting of the library, was the first major component discussed. We then discussed several categories of library resources that describe the library as a whole and which are superimposed above the matrix. In order to add specificity, the activities of the library were categorized into a series of programs represented by the rows of the program data. By reviewing a series of broad questions that are put to managers, we developed a series of measures (dimensions) that describe the programs of the library, represented by the columns in the matrix. Thus, in each cell of the matrix we have a number of data elements, and these comprise the "pieces" of the data base. Finally, outcome/performance measures were highlighted in our discussion because of the complex and developmental nature of the area.

Figure 2

SUMMARY OF
MANAGEMENT INFORMATION SYSTEM FOR LIBRARIES

Organizational Goals and Objectives



PROGRAM DATA

Programmatic Activities (Functions) \ Categories of Measures	Revenue/Expenditure Measures	Personnel Measures	Facilities Measures	Activity Measures	User Measures	Outcome/Performance Measures
Administrative Services						
User Services						
Technical/Production Services						
Instructional Services						
Support Services						

The concept of data uses or applications has not been discussed in this document primarily because it is a separate topic worthy of a lengthy discussion in another document subsequent to exhaustive testing. However, there are several comments with respect to applications that the library manager should be aware of.

Management has long been plagued with the definitional and measurement problems of efficiency, effectiveness and productivity. The management information system presented allows the manager to link various components and data together in order to find substantive ways to define and measure these terms. In the case of efficiency, the activity and resource components (financial, facilities, and personnel) are linked together to provide answers. For effectiveness, the components used to define efficiency are augmented by the outcomes/performance component in order to define and measure the term. Finally, productivity can be defined and measured with this system by using the activity component measured against the resource components.

In addition to the applications and uses associated with efficiency, effectiveness, and productivity, there are numerous others that could be made. The data contained in the management information system can be utilized in independent "bits and pieces" that describe the library's activities. In many specific ways it also supports the individual reporting requirements of the library to state, federal, and other institutions. Although many other specific uses have yet to be detailed,

there is a great deal of flexibility within the data base to accommodate the individual needs of the library manager.

Finally, there are several summary points that need to be made about the management information system. This management information system contains a limited set of data elements. It is impossible and impractical to include all the data a manager could need for a variety of purposes. The manager can best meet these additional needs through the use of special studies, which supplement and build upon the definitions and categories of the data base.

Any management information system has only the ability to assist the manager in decision making. The data base will not make the decision for a manager, but it does allow for the use of concrete, objective data to be considered by the library manager in arriving at decisions. In contrast to the intuitive management style which is inefficient and often indefensible for accountability purposes, the quality of decision making is significantly improved by utilizing the data provided through a management information system.

In conclusion, the system, as previously outlined and presented in detail in Library Statistical Data Base Formats and Definitions, is a first major effort to develop such a comprehensive system of information for academic and public libraries. Although the system is in the process of being pilot tested, the practical application of the system will dictate refinements, changes, and additions, particularly in the area of outcome/performance measures. Nevertheless, the system provides an excellent beginning point for the individual library and library manager to have as a valuable management tool.